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TRANSLATIONS ON EASTERN EUROPE

SCIENTIFIC AFFAIRS

No. 563

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CONTENTS PAGE

GEOLOGICAL COOPERATION IN CEMA OUTLINED

Budapest FIGYELO in Hungarian 14 Sep 77 p 17

[Article entitled: "Geological Cooperation in CEMA," based on remarks by Gusztav Morvai, vice president of the Central Land Office]

[Text] In CEMA [Council for Mutual Economic Assistance], geological cooperation is currently carried on within the framework of three organizations: overwhelmingly within the Permanent Geological Committee, to a lesser extent within the Oil and Natural Gas Industrial Committee, or rather within the framework of the Permanent Commission on Technical Assistance.

The Permanent Geological Committee, founded in 1963, aids the economic and scientific collaboration of the CEMA countries mostly through coordination, and to a lesser extent through fostering cooperation. Within its scope belongs the support of all joint efforts toward exploration for hydrocarbons as well as for solid mineral raw materials. The INTERMORGEO Coordinating Center was formed in 1972 to develop the necessary tools and to organize the expedition efforts for the exploration of the ocean floor. The characteristic form of work in the realm of geological cooperation is the preparation of recommendations.

These recommendations are directed first of all to the promotion of new research, toward the development, utilization and standardization of geophysical and laboratory methods and instruments, and especially since 1972, toward the harmonization of environment protection activities. The INTERGEOTECHNICA Coordinating Center was founded in 1974 to support the development and improvement of geophysical and laboratory technical implements, instruments and equipment.

A relatively new assignment is the development of an information exchange system within CEMA. The International Technical Scientific Information Center, which has been operating since 1959, has the task of working out the theory and methology of the mutual information system. Within this large comprehensive system, sixteen branch information systems were formed until 1977, when at the last CEMA meeting the 17th, the geological branch information system, the GEOINFORM was organized.

The Permanent Geological Committee is also developing more extensively the system for cooperation in matters of decidedly economic nature. For example, within PETROBALTIC [expansion unknown] one of the economically oriented organs of INTERMORGEO designed for aiding ocean floor exploration, the Societ Union, Poland and the GDR are cooperating in exploring the shallow coastal strip of the Baltic.

The "Mongolian International Geological Expedition," formed two years ago is tying together through many parties the geological mapping and geophysical workings which had previously been conducted on a bilateral agreement basis. Hungary also delegated here those experts who had earlier conducted their exploration in Mongolia on the basis of a bilateral treaty. As the initial results of this collaboration hitherto unknown deposits of raw materials have already been discovered in various territories. Today already, negotiations are in progress on the extension of the collaboration to 1990 from the originally planned 1976 to 1980 time span.

In the sphere of the Permanent Committee on Oil and Natural Gas Industries two coordinating centers have emerged. The assignment of the first is the development of more effective methods of investigations--well logging--within the bore holes. The assignment of the second center is the development of suitable methods of computer processing of the geophysical data of hydrocarbon exploration. Our homeland is participating in both of these collaborations.

Hungary is participating in cooperative ventures in numerous areas and is endeavoring to make the advantages of these efforts fruitful for herself. We accepted roles in the discovery and standardization of suitable methods of measuring the hoped for raw material reserves. The joint development of methods suitable for exploration, for example, of the basin territories for hydrocarbon deposits and of tropical areas for bauzite deposits is under the leadership of Hungarian experts. Our experts acquired the necessary expertise for this role in Guinea, Ghana, Viet Nam, British Guyana, Iran and India.

We have involved ourselves in the perfection of those procedures with which the so-called hidden--hence those without surface manifestations--raw material incidences can be discovered. This was responsible for our success at Recsk, where with the utilization of the most modern methods--for example, hydrogeochemical, giogeochemical, rock geochemical and geophysical procedures we managed to increase our country's raw material wealth to a significant degree.

Of outstanding significance is the Hungarian part in the development of instruments. In our country the heat increase with depth is more rapid than the world average. For this reason those geophysical implements developed by the Hungarian National Lorand Eotvos Geophysical Institute and the Petroleum and Natural Gas Mining Industry Research Laboratory to operate at depths of 4000 to 5000 meters are usable at depths of 6000 to 7000 meters elsewhere. But the well logging equipment developed for

exploration at the 300 to 400 meter depths is also increasingly sought after not only by the socialist countries, but also by the developing and developed capitalist nations.

We are the leaders also in the area of seismic methods and instrument development carried on under the aegis of the Permanent Geological Committee of CEMA. One of our prominent achievements, for example, is the development of the SD-10 digital seismic station, which not only provides and processes with its own computer much more data and more accurately than was possible before, but also provides for multiple or even infinite repetition of measurements. This device is a product of a cooperative venture with the experts of the VEB Geophysical Plant of the GDR at Leipzig. One of its variants, made resistant to the effects of corrosion and vibration and mated to the R-10 Hungarian computer, is participating in CEMA's ocean explorations.

Cooperation, naturally, is mutually advantageous to all of the CEMA countries. We also have much to be thankful for, for the work performed in other friendly countries, and for their development and application of methods and instruments.

9093
CSO: 2502

WEAKNESSES IN MAINTENANCE OF COMPUTERS OUTLINED

Sofia RABOTNICHESKO DELO in Bulgarian 26 Oct 77 p 5

[Article: "At the Committee for State and People's Control"]

[Text] At a conference of the Committee for State and People's Control, held yesterday, a discussion concerning the very urgent question for the national economy regarding the development, introduction, utilization, and maintenance of computer equipment, took place. The Control Organs, jointly with the Committee for Science, Technical Progress, and Higher Education, made an inquiry on how the Party and Government decisions in this field are being implemented by the Committee for the Unified System for Social Information and the Ministry of Electronics and Power and Electrical Engineering, the Ministry of Supplies and State Reserves, and the Ministry of Power.

The conclusion from the inquiry and the deliberations is that, despite certain successes achieved during the last few years, the development and introduction of computer equipment in the national economy is being delayed. The necessary measures call for a comprehensive improvement in planning, coordination, development, and implementation of the projects for automated control systems. The critical analysis during the inquiry contributed for the rapid elimination of certain weaknesses and in outlining measures for overcoming the remaining shortcomings. In the future special attention must be devoted to the improvement, maintenance, and servicing of computer equipment as well as for the efficient utilization of the equipment. Following the deliberations decisions were approved. (BTA)

CSO: 2202

NUCLEAR RESEARCH INSTITUTE STRIVES FOR INDUSTRIAL SPIN-OFFS

Budapest NEPSZABADSAG in Hungarian 21 Oct 77 p 4

[Excerpts] The first practical use of particle detection was in connection with uranium research. Over the past decade ATOMKI [Nuclear Research Institute] has developed a method of particle detection in addition to the former instrumental and photo emulsion system. Simple plastic foil can be used to detect alpha particles and even protons under certain conditions. These so-called solid state trace detectors can be used in raw material research. Hungary has played a pioneer role in the discovery and application of this kind of detecting. Plans call for the use of such foil-type detectors in the dosimeters which will be used to protect, for instance, the workers of the Paks nuclear power plant.

The prevailing attitude at ATOMKI is to seek always for ways of using results in other branches of science and in practice. Industrially commissioned research performed by the Institute is a source of separate income which can be used to hire personnel or buy instruments. Today the scientists of ATOMKI are working in 12 groups on 15 themes. Although nuclear research per se is not a stressed field in the national long-term scientific research plan, 40 percent of the Institute's research themes are stressed, and 25 percent are connected with stressed themes. Even the 5 million-volt Van de Graaf generator, built in its entirety by Hungarian industry and long considered solely an instrument for pure scientific research, is now being put to other uses. When the particle streams emitted by the instrument are focused on a piece of metal, they penetrate it to a depth of up to 10 microns. This makes it possible to determine whether alloys have gone deep into the metal or whether they lie along the surface layer.

The vacuum technology department of the Institute developed an instrument with which it is possible to identify what kind of gas is causing the minute pressure remaining in a vacuum. When the instrument was displayed at the Budapest Fair, it came to the attention of a pediatrician who was anxious to have it to analyze continuously the composition of the gases exhaled by patients. The Medicor Works will soon begin manufacturing the instrument, the use of which will at times make cardiac catheterization unnecessary.

The cryogenics laboratory where liquid nitrogen and helium are prepared has also found an interesting theme: It was accidentally learned that the gallium produced at the aluminum foundry of Ajka is insufficiently pure. Furthermore, the producers are unable to determine the extent of impurity beyond a certain limit. Through use of residue resistance monitoring techniques at very low temperature, the Institute is able to determine the purity of the gallium. This is of great importance since Hungary is the second largest exporter of gallium in the world, and gallium arsenide not only competes with but may soon supplant silicon in transistor technology.

CSO: 2502

BRIEFS

MORE MINICOMPUTERS--The Tab plant of the Videoton Factory is being modernized; plans call for production of 200 VT-51 minicomputers at the plant beginning in 1979. [Budapest FIGYELO in Hungarian 19 Oct 77 p 15]

NEW POTENT HERBICIDE--A new, highly potent herbicide, NITROSORG, is being produced by the Nitrokemia Factory. The agent effectively combats weeds which are traditionally resistant to weed killers. [Budapest FIGYELO in Hungarian 19 Oct 77 p 15]

CSO: 2502

BASIC SOFTWARE FOR MERA 305 MINICOMPUTER DESCRIBED

Warsaw INFORMATYKA in Polish No 8, Aug 77 pp 1-4

[Article by Andrzej Nawrocki and Zbigniew Pietrzyk, Warsaw Information Science Research and Development Center: "Basic Software for the MERA 305 Minicomputer"]

[Text] Basic software for the MERA 305 minicomputer, based on SAWIK, has been developed by the Information Science Research and Development Center of the Information Science Association (at the request of the ZSM [Minicomputer System Works] MERA Research and Development Center).

The software consists of:

Accessing files and disk libraries;

The LADOWACZ operating system;

The NATRENT/SAWIK macrogenerator;

A set of auxiliary programs.

The main problem confronting users of the MERA 305 minicomputer is that despite its relatively fast operating speed (on the order of one million operations per second) the machine's internal storage is small (8 Kbytes). Also, the poor performance of the minicomputer relative to disk operations (written in SAWIK for the programmers) created immense problems for the programmers.

SAWIK is a symbolic language in which each instruction corresponds to one machine instruction. Thus, its instruction set is very limited. Arithmetic instructions practically do not exist. One can only add binary, single-byte integers. Input-output instructions operate with single characters. Instructions enabling operations on multibyte fields also are not available. Thus, SAWIK is used only in a limited way in operations in which programming at the machine level is required. For this reason, work on an operating system and extending SAWIK's capabilities in the form of NATRENT was undertaken.

While the basic software was being developed, a number of auxiliary programs were also realized, which were included in the basic software as system programs.

The LADOWACZ Operating System

Functions of the System

The LADOWACZ operating system permits the user:

--To store system and user programs on disks;

--To transfer binary programs from a paper tape reader or from designated disk sectors (called libraries) to internal storage;

--Various modes of operations on the programs (standard, automatic, sequencing of automatically called-out programs and so forth);

--To construct large segmented programs as well as programs that utilize subprograms of the system disk library.

The Disk Library

To obtain faster access to particular areas of a disk, it is possible to divide the disk into sectors, called libraries (one system library and 16 private user libraries). The system library is available to everyone, but the private libraries are available only to authorized users; an unauthorized request to access a private library is rejected.

LADOWACZ can operate with only one library at a time, but with the use of appropriate commands, the user can operate with various libraries.

LADOWACZ Commands

Operating under the control of the LADOWACZ operating system, the user instructs the minicomputer by typing a command via the printer keyboard. LADOWACZ's replies to the command regarding the execution or nonexecution of the command, the legality of the command or termination of program operation are printed out on the same printer. Here are some of the commands realized by LADOWACZ:

Command to load programs: *L <program name >.

Command execution depends on moving the designated program from disk to internal storage. The printing out of the letter P on the printer signifies the successful transfer of the program. The printing out of the letter N on the printer signifies that the designated program is not in the library.

Command to read a program: *C.

This command causes a binary program to be read from a paper tape reader to internal storage.

Command to initiate program: *S

This command initiates program execution starting at internal storage byte 1984.

In designing the LADOWACZ system, it was assumed that programs would be located in internal storage starting at a predetermined area. Some programs (system or user) can be located under a different address and initiated by a different command.

LADOWACZ mode of operation command: *L or *R.

The first one requests operation with the library system and will always be executed. The second requests operation with a private library and will be realized by the system upon verification of the user's authority.

Auxiliary Programs

A number of auxiliary programs are included in the system library. Here are some of the programs:

SYSTEM -- printout of information about the construction and operation of LADOWACZ

PAO -- printout of contents of internal storage cells in various formats

ZAPAM -- altering the contents of individual bytes of storage memory

REPRO -- reproduction of paper tape

TLISTA -- printout of contents of punched tape (source)

BLISTA -- printout of contents of binary punched tape

EDIT -- Correcting the program via the keyboard (creating a new source tape).

In case of need, any auxiliary program can be loaded and initiated using the proper commands. After executing a command, LADOWACZ returns to a waiting status and is ready for the user's next instruction.

Breakdown of the System of Internal Storage

The LADOWACZ binary program consists of three parts:

--The "reader," which is the part that permits the transfer of other parts of the system into internal storage;

--A program that organizes disk transmission operations (disk PR);

--A LADOWACZ program that reads individual commands and controls their execution.

Figure 1 illustrates the allocation of LADOWACZ in internal storage.

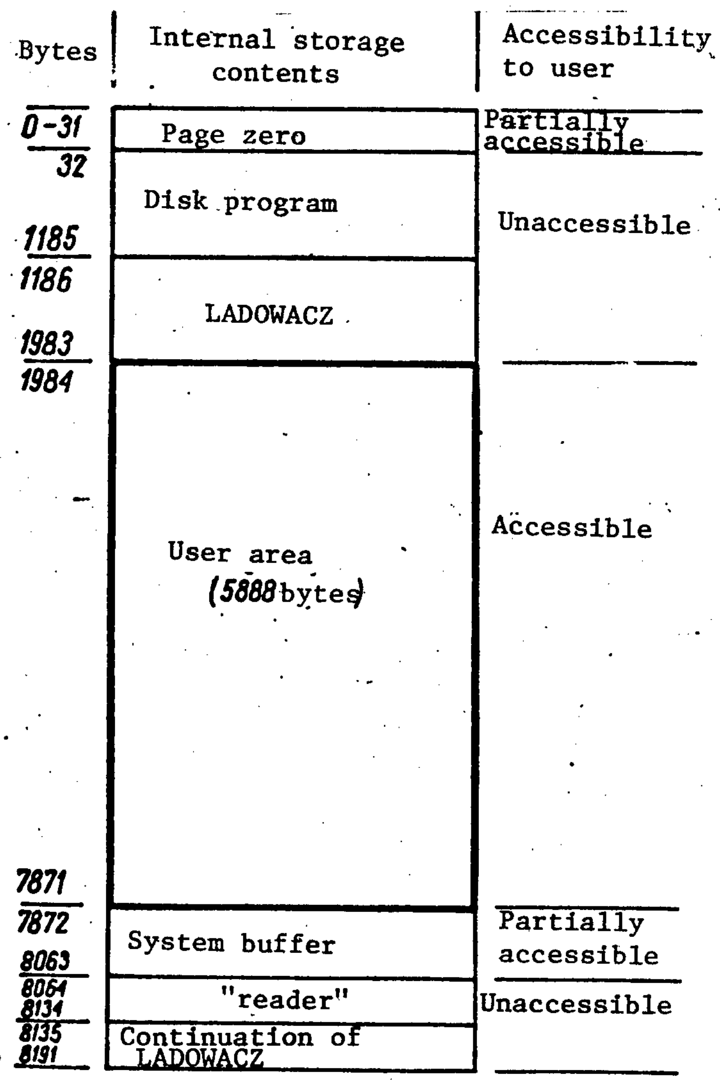

Figure 1. Allocation of LADOWACZ in internal storage

Construction of Programs

Depending on size and degree of complexity, programs are designated as:

--Nonsegmented programs;

--Segmented programs;

--Complex programs.

Nonsegmented Programs

Nonsegmented programs are short programs that do not utilize segmentation and do not have subprograms. They are loaded into internal storage from the disk library or from paper tape (binary).

Segmented Programs

Segmented programs are large programs that are too big for the available internal storage and must be divided into separate sections called segments. In the program, one segment is designated as the main segment and it functions as the control program for executing the remaining interchangeable segments.

The user initiates operation only for the main segment. The interchangeable segments are controlled automatically. Segmented programs are stored in the disk library.

Complex Programs

Complex programs are segmented or unsegmented programs that contain subprograms. Along with the main program, the subprograms are stored in internal storage; the extent of the storage is designated for each program individually (see Figure 2). All system library subprograms have the same starting address. When a program utilizes several subprograms, the internal storage requirements of the subprograms is determined by the storage taken up by the largest subprogram. In the program, interactions with the library are controlled by NATRENT instructions that load the subprogram. Once a subprogram is loaded, it can be called out any number of times (until another subprogram is loaded).

The NATRENT/SAWIK Macrogenerator

Principles of Operation

The dual-process SAWIK translator that had been utilized did not use a disk because it was necessary to read a source program twice to produce a binary program paper tape. This advantage has now been eliminated. The SAWIK translator has been combined with the NATRENT macrogenerator enabling the use of macroinstruction equipment. Macroinstructions can be written by a

programmer, who can also take advantage of the extensive macroinstruction set and large number of standard programs written in NATRENT. A programmer writing a program in NATRENT can use standard macroinstructions and programs or write his own macroinstructions and SAWIK instructions.

Translated binary programs can be stored in disk libraries. The macrogenerator is treated by the operating system as a user program, and thus it can be stored in the library from whence it can be loaded into internal storage just like any other program.

A source program in NATRENT can be punched on many paper tape segments. In time, they may or may not be read or printed out on a printer.

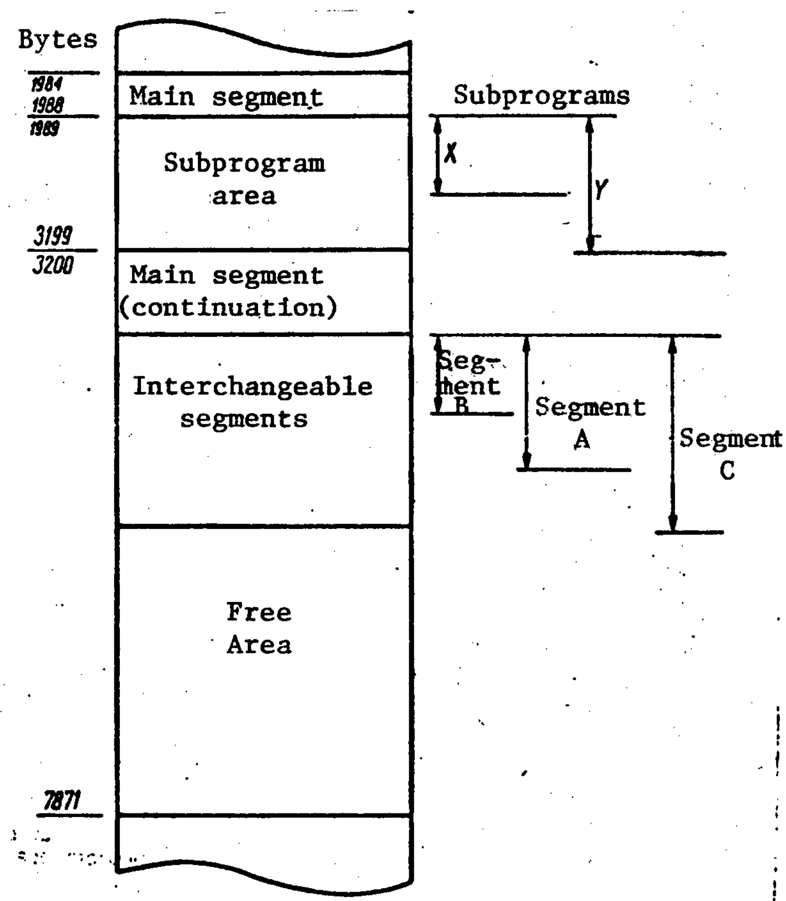

Figure 2. Internal storage user-space layout (including a sample complex program)

The macrogenerator translates a NATRENT program to a SAWIK program, substituting the appropriate macroinstruction parameters in the called-out macroinstruction selected from the disk library (that is formal arguments are replaced by appropriate actual arguments). Such a generated program is stored in the working area of the SAWIK translator and then translated into a binary program. Passage from generation step to translation step occurs automatically. The binary program can be stored in the library from whence it can be loaded into internal storage any number of times. A schematic diagram of the operation is shown in Figure 3.

Data Types

NATRENT differentiates the following data types:

--Binary numbers

--Formated numbers

--Texts

Binary numbers can have a value of 0 to 255, are binary coded and occupy a single byte.

Formated numbers consist of two parts: a format byte and a digit. The number can contain a minimum of one or a maximum of 15 decimal digits. The digits are binary coded and occupy a single byte. The number of digits is specified in the four least significant bits of the format byte. The four most significant bits specify the number of digits after the decimal point. There can be a maximum of seven digits after the decimal point. If the number is negative, then the most significant bit of the first digit has a value of 1, and for a positive number (including zero), it has a value of 0.

Some examples:

$\underbrace{0000\ 0001}_{\text{format byte}}\ 0000\ 0001$ — Has a decimal value of 1 and format (0.1)

$\underbrace{0001\ 0010}_{\text{format byte}}\ 0000\ 0011\ 0000\ 0101$ — Has a decimal value of 3.5 and format (1.2)

$\underbrace{0001\ 0001}_{\text{format byte}}\ 1000\ 0101$ — Has a decimal value of 5 and format (1.1)

Texts consist of two parts: a length byte and the actual text. The length of the actual text is at least 1 and at most 127.

Macroinstructions

In order to use a macroinstruction in a program, it is first necessary to define it, that is to designate a name, specify the number of parameters and contents.

An example of a macrodefinition:

```
≠≠MAKRO PAMSL 1;
ZA.; AS.; DS.5; US.; &1/5; PZ.&1;
AS.; DS.6; US.; &1+1/5; PZ.&1+1;
≠≠M-KONIEC;
```

Every macrodefinition begins with the text "≠≠MAKRO" and ends with the text "≠≠M-KONIEC".

After the word "≠≠MAKRO," the name of the defined macroinstruction appears and then the number of parameters. A macroinstruction can have up to nine parameters.

The content of the macroinstruction begins after the semicolon which is required after the number of parameters, and ends before the text "≠≠M-KONIEC". In the macroinstruction contents, formal parameters are designated by two characters: the & character and the digit directly after it. The digit designates the number of parameters in the macroinstruction.

The content of a macroinstruction can include SAWIK, NATRENT or its own macroinstructions.

The use of a macroinstruction in a program is termed a macro callout (calling out of a macroinstruction).

For example: ≠≠PAMSL ROB;.

The name of the macroinstruction appears after the symbol "≠≠", followed by any number of spaces, and then a list of actual parameters (in the example, there is one parameter). If the macroinstruction has more parameters, then the proper number of actual parameters must be present in order to call out the macroinstruction. The actual parameters are separated from one another by commas.

The macrogenerator substitutes a macro callout with the contents of the macroinstruction in which the characters "&1" are replaced by the first actual parameter, "&2" by the second actual parameter and so forth. If a macroinstruction contains a callout of another macroinstruction within it, then the second macroinstruction is also executed. Every occurrence of the symbol "≠≠" in a program is treated as the start of a macro callout.

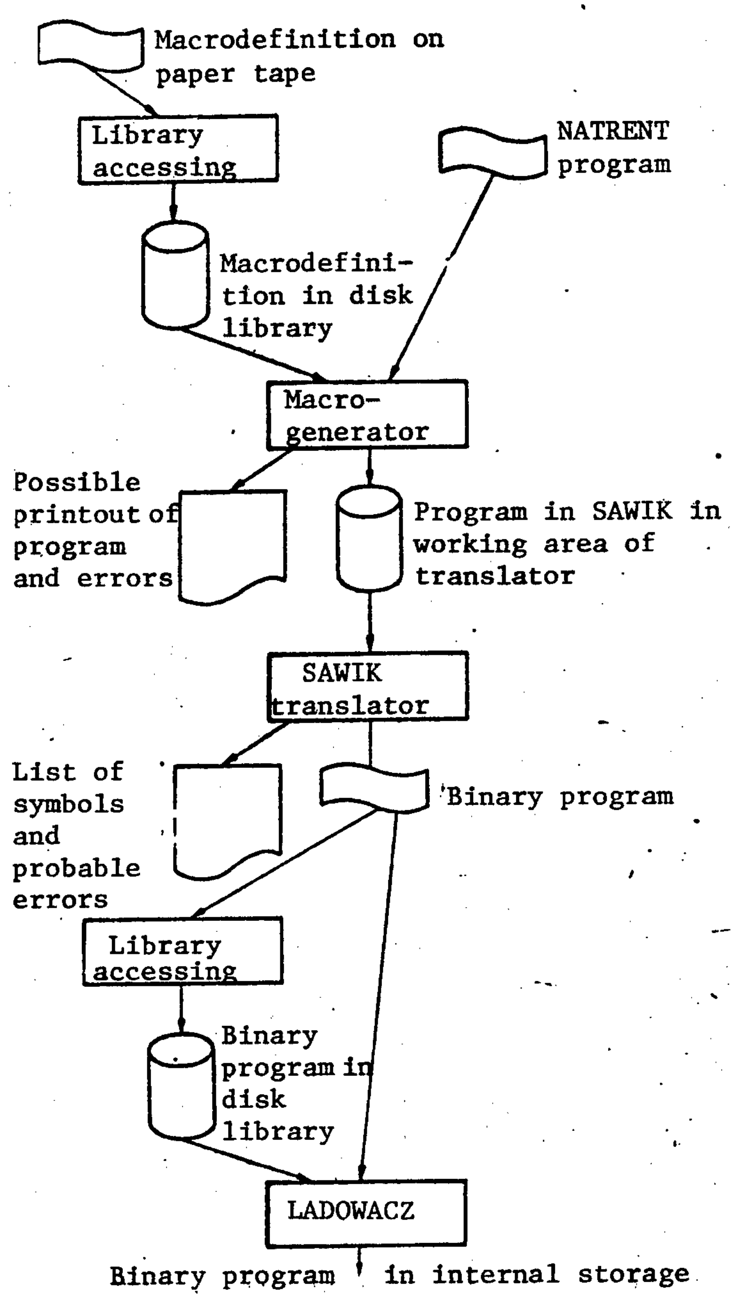

Figure 3. Schematic diagram of macrogenerator operation

Primary Features of NATRENT

The NATRENT language consists of a standard set of macroinstructions and subprograms. We call the standard macroinstructions NATRENT instructions. Some of them require certain subprograms in storage. For example, arithmetic instructions operating on formated numbers depend on the transfer of parameters and then directing them to the proper program for execution of the given operation. When a user program is being executed, standard subprograms must be stored in the library from whence they can be transferred into internal storage via an appropriate NATRENT instruction.

There are situations wherein a program may be too large for internal storage (about 6 k bytes are available for a user program). In such a case, it is divided into segments.

Generally speaking, a program can consist of one or many segments. Among the segments, one is designated as the main segment and is always stored in internal storage. The other segments are known as interchangeable segments. They are stored in internal storage as required, that is when called out by the main segment. All interchangeable segments of a given program have the same starting address in storage. The program begins execution on the first instruction of the main segment and ends on the last instruction of the main segment.

During program execution, any number of interchangeable segments can be called out. When an instruction is reached in the main segment calling out for an interchangeable segment, the interchangeable segment is loaded into internal storage from the library and it assumes control.

When an end-of-segment instruction is reached in an interchangeable segment, control is directed back to the main segment (to the instruction following the one calling for the interchangeable segment).

If the program is segmented, that is consists of more than one segment, then it has to be stored in the disk library prior to execution.

Instructions exist in NATRENT that allow the setup of loops. A loop is started by means of an instruction initiating a loop counter and ends with an instruction examining for the end of the loop. The loop is executed as many times as indicated by the loop counter.

The loop counter can be initiated by means of a constant or variable binary. Existing input-output instructions for binary numbers, formated numbers and texts enable operations with a printer, perforator, printer keyboard and punched tape reader. Appropriate internal to external conversions and vice versa are executed.

The following arithemtic operations can be performed on formated numbers: addition, subtraction, multiplication and division. In addition, the

language includes instructions to compare binary numbers, formated numbers and texts, conditional jump instructions and substitution instructions.

There also are special instructions which make it simpler for a programmer to operate on multibyte fields and thus removing the inconvenience created by automodification in the SAWIK language.

List of Instructions and Subprograms

Program Construction Instructions

START -- ordinary start

STARTA -- automatic start

STARTN -- start for program utilizing subprograms

SSTART -- start for segmented program

STOP -- end of main segment

SEGMENT-- beginning of interchangeable segment

SKONIEC-- end of interchangeable segment

WYWOLAJ-- callout interchangeable segment

LADUJ -- load subprogram

LADUJP -- load program

Control instructions:

INICST -- initiate loop counter with constant binary

INICZM -- initiate loop counter with variable binary

CZYKON -- examine end of loop

SK -- unconditional jump

SKA = 0

SKA < 0 -- conditional jump

SKA > 0

Input-output instructions:

CZYTT -- read text

PISZT -- write text

CZYTL -- read formated number

PISZL -- write formated number

CZYTB -- read binary number

PISZB -- write binary number

Arithmetic instructions for formated numbers:

DODAJ -- add

ODEJMIJ-- subtract

MNOZ -- multiply

DZIEL -- divide

Comparison instructions:

PORT -- compare texts

PORL -- compare formated numbers

PORB -- compare binary numbers

Move instructions:

PRZT -- move text

PRZL -- move formated number

PRZB -- move binary number

PRZESLIJ--move blank space

FORML -- formating

Special instructions:

UMADR -- place address in register

UMWR -- place address content in register

PAMR -- remember register content

POB -- collect character according to register

PAM -- remember character according to register

COF -- remove address in register

WYKIN -- address directly

The development of the above described basic software permits easier writing of programs at the symbolic language level for the MERA 305 minicomputer. In addition, this software greatly increases application possibilities and can be a tool for building user systems. It also should be emphasized that toilsome operator actions have been reduced to a minimum.

11899
CSO: 2602

OCEANOGRAPHERS STUDY MEDITERRANEAN

Bucharest STIINTA SI TEHNICA in Romanian No 8, Aug 77 p 6

[Article by Ludovic Roman]

[Text] "Romanian oceanographers have performed the largest and most complete zonal monograph study to date of the Mediterranean Sea." We heard this firmly stated sentence in Constanta, at the laboratories of the Romanian Institute for Marine Research. And in our conversation with rear admiral Constantin Tomescu, director of the institute, doctor in biology Gheorghe Serpoianu, its scientific director, and several of the oceanographers who worked on the ship Delta Dunarii, the base vessel of the research conducted in the Mediterranean, these words recurred as an echo of an exceptional scientific integrity.

The figures are impressive: four expeditions covering all four seasons, more than 5000 chemical determinations per expedition, nearly 1000 plankton tests, 540 thermal measurements, ecology charts obtained for 700 marine miles, more than 400 trawlings, and 1000 km of coastal waters subjected to detailed scientific observation.

Of course, these are far from being complete statistics. In keeping with the Romanian-Lybian collaboration contract, the primary goal was the fish fauna and the formulation of fauna charts and inventories. The researchers determined the physical, chemical, and biologic conditions of the marine environment in the zone; they also performed fishing tests, particularly by using Romanian trawling equipment. The diving team performed many descents for a direct study of the nature of the sea bottom and gathered a wealth of scientific material. The zone under study covered the Lybian coast between Ras Azzaz and Ras Karkura, for 12 miles from shoreline; this zone had been totally blank in the atlases of oceanographic research. The instrumentation used by the Romanian scientists during their Mediterranean studies, and the methods which they applied, were of the highest quality, enabling them to conduct complex and very accurate analyses. The investigation of the sea water chemistry, for instance, involved salinity, acidity, organic matter content, oxygen, carbonates, bicarbonates, nitrates and nitrated elements, phosphates, silicates, alkalinity, and so on.

The Romanian scientific research in the Mediterranean Sea has disclosed the hydrologic properties of the zone in question, compared it to neighboring zones, and discovered a totally unknown area of formation of so-called "water masses" with specific characteristics different from the remainder of the sea water. Very interesting data was obtained from the study of the "Atlantic current" composed of a water layer with lower salinity; the data was used to establish its degree of influence, its hydro-biologic interactions, and its connection to the bioproductivity of the zone.

The Romanian oceanographers who conducted their activities during the four expeditions into the Mediterranean Sea have written four compelling scientific papers and a complete bibliography of the studies devoted to that sea.

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CSO: 2702

CHEMICAL INDUSTRY MINISTER DISCUSSES POLYMER APPLICATIONS

Bucharest STIINTA SI TEHNICA in Romanian No 8, Aug 77 pp 12-13

[Interview with Eng Mihail Florescu, minister of the chemical industry, by Petre Junie]

[Text] [Question] A world-renowned scientist, the chemist N. N. Semenov, characterized the 20th century as the "century of atomic energy and polymer materials." Could you review for our readers the major areas in which plastics have received a widespread application?

[Answer] The proportion of plastic materials used in various domains differs from country to country, being generally a function of the structure and production volume of the respective sectors. For the world as a whole, the distribution is the following: 25-33 percent for packaging, 23-25 percent for constructions, 14-20 percent for electronics and electrical applications, 1-18 percent for machine construction and motor vehicles, 7-13 percent for consumer goods, and 1-3 percent for agriculture. We will examine each in turn.

Packaging. The use of plastics in the packaging industry will grow at an average rate of 12 percent/year and in Romania will continue to be significant (35 percent in 1975, 30.3 percent in 1980). The average rate of growth throughout the world is estimated at 10 percent, and the development in each country will be proportional to the national product.

As a repercussion of the oil crisis, it is estimated that the contribution of the packaging sector to the consumption of plastic materials will not reach the figures anticipated before the crisis (16-17 percent in the United States and West Germany, and 30 percent in England), but the sector will still be the largest user during the 1975-1980 period. The major areas of plastic utilization will be a largest penetration into the present markets for glass, an expansion and improvement of packaging systems (pallets, minipallets, bales, shrinkable films, bunching, and so on), a larger use of porous plastics, and so on.

The classification of various plastics in order of importance, is as follows: low density polyethylene (as films, containers, bottles for products where permeability plays a secondary role); high density polyethylene and polypropylene, for their rigidity, low gas permeability, chemical resistance, and non-toxicity (as films, bottles, containers for the food industry, cosmetics, pharmaceuticals, detergents); rigid polyvinyl chloride (as bottles, containers, packaging for food, household, and industrial products); plasticized polyvinyl chloride (as films, for non-comestible products, detergents, and other products in general, or under certain conditions for food products); polystyrene and its copolymers (as sheets or rolls expanded or printed with paper, for containers, boxes for food, pharmaceutical, and other products). Polyamide in the form of films laminated with polyethylene is used increasingly for packaging sliced meats and cheeses. The remaining plastic materials have a smaller and limited use in the field of packaging.

Construction materials. The production of fabricated plastics for the construction sector will grow in Romania from 12.9 percent in 1975, to 15.4 percent in 1980, at an average annual rate of 24 percent.

As a result of the low housing construction activity, industrialized countries will have overall growth rates of 10-15 percent, with 30-35 percent for some products (moldings, laminated panels, insulation, plumbing supplies and pipes). An approximate 6-fold increase is anticipated in the use of bathroom fixtures made of reinforced polyesters, acrylic polymers, and ABS.

During the 1975-1980 period, the proportion of tubing production (primarily polyvinyl chloride, followed by polyolefins) will remain at 4.8 percent, even though the production volume will double.

For polymers, the consumption structure in 1980 will be 81 percent high density polyethylene, and 1 percent low density polyethylene. In 1974, the proportion of this sector was 8 percent in the United States and 14 percent in the Common Market countries, and will increase by 10-12 percent/year in these countries. The consumption structure is different because the proportion of polyvinyl chloride is about 60 percent, followed by polyolefins, polystyrene, and polyurethane.

In Romania, we have designed and are producing for constructions piping, electrical insulation conduit, joints, panels of various shapes, melamine sheets, lamp globes, films for insulation, polystyrene and polyurethane foams in the form of panels and sandwich structures, and bathroom fixtures. During the 1976-1980 period production will be diversified primarily toward expanded materials with porous structures (polyolefins, ABS, polystyrene, PVC, polyurethanes) which will be used in the form of sheets, insulating panels, moldings, and so on.

Electronics and electrical applications. If we include in this sector the production of insulators for cables and wires, which will represent 80-88 percent, the consumption of plastics in Romania will grow at an average rate of 25 percent/year, going from a proportion of 19.9 percent in 1975, to 20.9 percent in 1980. For the world as a whole, the sector is expected to develop by about 15 percent, varying between 13 and 22 percent from country to country.

In Romania, the largest usage in the electronic and electrical applications sector will be for items fabricated from polyvinyl chloride, ABS, polystyrene, polycarbonate, AS copolymers, polyacetals, polyphenyl oxide, cellulose acetate, in the most diverse forms, from insulators and frames for instruments, to knobs, parts, and so on. During the 1975-1980 period, an increasing emphasis will be placed on the design and development of polyolefins with compact and porous structures, especially for cable and wire insulation, which is presently manufactured from polyvinyl chloride.

Machine construction and motor vehicles. The consumption of plastic items in the construction of machines and motor vehicles in Romania (with the exception of cable production) will develop at an average rate of 44 percent/year, its proportion increasing from 4.4 percent in 1975, to 5.3 percent in 1980.

It is estimated that in the industrialized countries this sector will consume 14-16 percent of the polymers in 1980, added to which will be the consumption of the industry for means of transportation, with a proportion estimated to as much as 20 percent, and a growth rate of 25-30 percent. According to the most recent data (which covers the year 1975), polyvinyl chloride, polyolefins, and styrene polymers represented 35.8 percent of the total consumption of plastics, the remaining 64.7 percent being devoted to other unspecified polymers.

The fabrication of reinforced polyesters has seen a large increase in the automotive industry, for electric locomotives, and for equipment and conduits in the chemical and food industry. The Dacia automobiles and the Roman trucks, as well as many other means of transportation use a large number of styrene copolymer and polyurethane parts. The naval industry also uses a large amount of plastic materials, particularly for refrigeration insulation, and for many parts in the construction of ships. Similarly, refrigerators are built predominantly from plastic materials, particularly styrene copolymers (ABS).

The areas of utilization in machine construction is constantly diversifying, and the introduction of small scale production plastics with outstanding properties shows that they will be used even more widely to build machines which will not only save metal, but will also have better operating properties.

Agriculture. The consumption of plastic parts in Romania's agriculture will grow at an average annual rate of 35 percent, its proportion increasing from 3.6 percent in 1975, to 6.1 percent in 1980. Because of differences in statistical structures, comparaison with figures published by other countries

is difficult. The new forecasts for the world as a whole, foresee an average annual growth rate of 4.4 percent.

Plastic products in this sector are used in the form of low density polyethylene films for maintaining soil humidity, for covering crops, as greenhouses for vegetables and fruits, and as linings for silos, canals, and reservoirs to prevent infiltration. Next in order are polyvinyl chloride and polyolefin tubes and pipes, used for drainage, watering, and hydraulic works. Although polyvinyl chloride films are competitive with polyethylene films, they are more difficult to reuse since they cannot be efficiently reprocessed.

As part of the agricultural program of the current five-year plan, the plastic materials industry will build large installations to produce reinforced polyethylene sheets for greenhouses and hothouses, and a new plant will be placed in operation in 1977 to produce pipes for irrigation and meet the needs of our agriculture.

[Question] Many ecological researchers stress the danger presented to the environment by the rapid development of the plastic materials industry. What solutions are presently being envisaged to prevent the excessive, irreversible pollution of the earth with such nondegradable wastes?

[Answer] The major problems associated with waste plastic materials are the problem of wastes remaining from the use of plastic materials, and the problem of wastes created by the manufacture of polymers (which is similar to that of the organic industry, with a few specific particularities).

In practice, the plastics processing industry produces few wastes due to the possibility of recycling during manufacturing processes. In the case of heterogeneous mixtures and of thermorigid materials, the wastes are incinerated and the thermal energy is recovered.

The principal problem of actual wastes therefore arises with the end user, when he no longer can use the product after it becomes worn. This is the area which faces the major problems of environmental protection, of rational, optimum utilization, and of destruction of wastes.

The household and commercial plastic materials wastes are relatively small, representing only 2-5 percent of the total wastes (it is expected to reach a maximum of 6 percent in 1980). They can be destroyed sensibly by the traditional methods used for garbage.

The problem of sensibly exploiting plastic wastes (exclusive of household and commercial ones) can be solved in full through the following steps:

Organizing the collection of wastes and their sorting by types of polymers in specialized enterprises.

The flotation, washing, and recovery of wastes as raw materials, integrally or in mixtures.

Incinerating with recovery of thermal energy, thereby creating new forms of energy and reducing the use of natural resources.

Pyrolysis (combustion in the absence of oxygen) to produce fuel gases and oils, and eventually even the constituent raw materials (monomers, solvents, and so on).

The present -- and it appears, future -- orientation is toward incineration and pyrolysis with primary recovery of the energy contained by the plastics (and less for recovery of the constituent raw materials such as monomers and solvents, which raises economic and technical problems), and toward flotation, washing, and integral or partial recovery of plastics contained in wastes (a process which is being used in Romania at present).

[Question] In closing our conversation, could you please outline the main directions of the future development of the dynamic domain of plastic materials in Romania and throughout the world?

[Answer] In the light of the presently available data on the future development trends for the plastics industry, we can draw the following general conclusions:

Since the development of the plastics industry is now determined by the general level of technologic development, the highly industrialized nations will continue to provide the largest contribution to the world production of plastic materials.

The forecasts for the development of plastic materials until the year 2000 are very optimistic. Some of the predictions are that by the eighth decade of our century the world production of plastics will equal in volume the production of steel, and that it will be five times higher by the year 2000.

By 1990, the development of plastics production as well as the production per inhabitant during the next decades, will place Romania at the level which will be reached in 1980 by the most industrially developed countries in the world, which have been manufacturing these products for more than one half a century.

The development trends in the production of plastic materials in Romania can be outlined as follows:

The growth rate of the Romanian industry matches that of the developed countries.

In terms of structure by sectors of use, there is an opportunity to increase the number and diversity of the polymers used for tubing, cables, wires, furniture, machinery, and constructions.

In terms of manufacturing processes, there is a greater orientation toward producing and using reinforced and alloy-type materials, expanded and cellular materials, and improved tooling.

Within the framework of economic development, the directives for the development of the socialist economy for the 1976-1980 period, as well as the Party Program formulated and approved by the 11th Party Congress, have established important tasks for increasing the production of plastic materials. The annual and five-year plans which will be formulated on this basis stipulate a rapid development capable of assuring the substitution of materials in short supply, such as metals, wood, textiles, and leather, which can no longer be met from natural sources, and whose needs are dictated by the continually improving standard of living.

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